

Managing Side Effects of Oral Appliance Therapy



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University of Pacific DSM Mini-residency 2018

Conflict of Interest Statement

I wish to disclose the following potential conflicts:

- Financial support for a product (Adjustable PM Positioner oral appliance) licensed and fabricated by Dental Services Group, Dental Prosthetic Services (will not be discussed today)
- Co-founder Sleep Performance Institute—no conflict with program contents
- I will not discuss off label and/or investigational use of products or devices

Jonathan A. Parker, DDS

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Managing Side Effects and Complications of Oral Appliance Therapy

Keys to Success:

- Identifying the problems and the probable causes
- Determining solutions and implementing a plan

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Recommended Reading: AADSM Guidelines

JDSM

SPECIAL ARTICLES

<http://dx.doi.org/10.15331/jdsm.6746>

Management of Side Effects of Oral Appliance Therapy for Sleep-Disordered Breathing

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As the field of oral appliance therapy (OAT) to manage obstructive sleep apnea has evolved over the past 30 years, side effects of therapy have become increasingly recognized. Although the most commonly observed side effect is unwanted tooth movement, a number of other side effects have been reported through anecdotes, case reports, and observational studies. Members of the American Academy of Dental Sleep Medicine developed a set of consensus recommendations to guide dentists in the management of side effects as a consequence of OAT. Thirteen expert clinicians were appointed to the panel, which used the modified RAND/UCLA Appropriateness Method to review the body of evidence on OAT side effects and to establish the recommendations. Clinicians are encouraged to use these recommendations in conjunction with their clinical expertise to minimize the side effects of OAT. The recommendations are based on knowledge to date and are expected to evolve over time. Future research should aim at timely identification of these side effects for positive treatment outcomes.

KEYWORDS: malocclusion, mandibular advancement, mandibular repositioning, mouth diseases and therapeutics, oral device, orthodontic appliance, sleep apnea (obstructive and snoring), tooth disease

CITATION: Sheats RD, Schell TG, Blanton AO, Braga PM, Demko BG, Dort LC, Farquhar D, Katz SG, Masse JF, Rogers RR, Scherr SC, Schwartz DB, Spencer J. Management of side effects of oral appliance therapy for sleep-disordered breathing. *Journal of Dental Sleep Medicine*. 2017;4(4):111–125.

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Managing Side Effects and Complications of Oral Appliance Therapy

Short Term Side Effects with MADs:

- Excessive salivation or dry mouth
- Pain in teeth
- Jaw pain
- Perception of tooth mobility
- Soft tissue irritation
- Allergic reactions

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Managing Side Effects and Complications of Oral Appliance Therapy

Long Term Side Effects with MADs:

- Jaw Pain
- Permanent Occlusal Changes
- Tooth movement
- TMJ Noise or Restriction

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Excessive Salivation

- **Prevalence:**

- In 12 studies assessing oral appliance therapy that included data on adverse effects (1999-2005)
- Prevalence of salivation = 7 - 68%
- Mean = 27.5%

Ferguson, et al. *Sleep* 2006, 29(2): 244-262

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Excessive Salivation

- **Probable Cause:**

- Presence of appliance in mouth
- Attachments or protrusions from appliance at corners of mouth

- **Solution:**

- Towel inside pillow
- Drooling will hopefully resolve in 2-3 weeks

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Dry Mouth

- **Prevalence:**

- In 7 studies assessing oral appliance therapy that included data on adverse effects from 1999-2005
- Prevalence ranged from 6 - 86% with an average of 38%

Ferguson, et al. *Sleep* 2006, 29(2): 244-262

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Dry Mouth

- **Probable Cause:**

- Poor nasal breathing
- Increased vertical dimension of OA makes it difficult for patient to maintain lip closure

- **Solution:**

- Nasal sprays with saline or medication
- Biotene, Oramoist, Neutrasal, etc.
- Micopore tape vertically over lips
- Close vertical Dimension on OA

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Allergic Reactions

- **Prevalence:** Little or no data (< 1%)
- **Source of Reaction:**
 - Latex
 - Acrylic Resins (Methylmethacrylate, ethylmethacrylate)
 - Metals (Nickel, etc)
 - Dyes
- **Solution:**
 - Avoid the reactive material in the OA

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Soft Tissue Irritations

- **Probable Cause:**
 - Hematoma from cheek/lip biting due to change in bite
 - Screw mechanism rubs on tongue or cheek/lip
 - Cracking at corner of mouth due to saliva pooling
- **Solution:**
 - Polish metal or acrylic areas that are rubbing tissues
 - If possible, D/C appliance until healed
 - Change to a different appliance

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Dislodging Dental Restorations

- **Probable Cause:**

- Appliance is too tight on teeth
- Recurrent decay or ill-fitting restoration



- **Solution:**

- Adjust/reduce the retention on appliance in the area that it was tight
- Determine if there is recurrent decay or ill-fitting restoration



Photos courtesy of Dr. B. Gail Demko

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Transient Soreness in Teeth

- **Prevalence:**

- In 8 studies assessing oral appliance therapy that included data on adverse effects from 1999-2005
- Prevalence ranged from 13-60% with an average of 36%

Ferguson, et al. *Sleep* 2006, 29(2): 244-262

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Transient Soreness in Teeth

- **Probable Cause:**

- Periphery is overextended
- Interproximal (IP) area is too well define
- Teeth are misaligned
- Inaccurate impression or wear or chipped tooth on casts

- **Solution:**

- Adjust periphery and/or IP areas to patient comfort on appliance

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Mobility in Teeth

- **Probable Cause:**

- Changes in mand position lead to changes in occlusion with increased lateral forces on teeth
- Retrusive forces on maxillary teeth and protrusive forces on mandibular teeth with MAD in place

- **Solution:**

- Prevention of occlusal changes
- Use of a splint retainer for maintaining tooth position

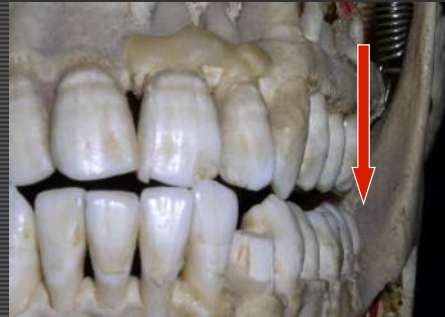
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Pain in 3rd Molar and Ramus Areas

Pain may occur on buccal mucosa in area adjacent to upper 3rd molars



Pain may occur on retromolar pads



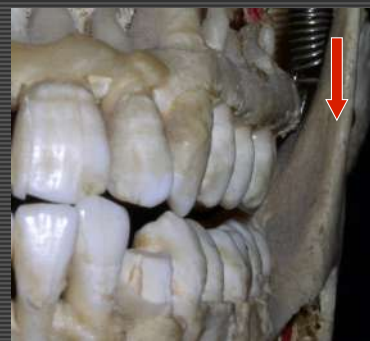
Photos courtesy of Dr. B. Gail Demko & Anton Voitik, MDT

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Pain in 3rd Molar and Ramus Areas

Probable Causes:

The thickness of the buccal aspect of appliance is compressing the mucosa against the ramus



Photos courtesy of Dr. B. Gail Demko & Anton Voitik, MDT

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Pain in 3rd Molar and Ramus Areas

Solution:

Reduce the thickness of the buccal area of last molar on appliance to allow room for the ascending ramus during advancement



Photos courtesy of Dr. B. Gail Demko & Anton Voitik, MDT

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Pain in 3rd Molar and Ramus Areas

Other Probable Causes:

The screw mechanism may protrude on the buccal aspect and impinge on the ramus as the jaw is advanced



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Pain in 3rd Molar and Ramus Areas

Solution:

May need to select a different appliance



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Pain in 3rd Molar and Ramus Areas

Probable Causes:

Maxillary portion extended beyond third molar area or too thick on distal-occlusal area and it impinges on tissues

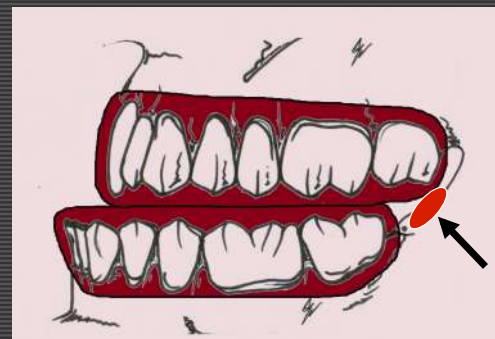


Illustration courtesy of Dr. B. Gail Demko & Anton Voitik, MDT

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Pain in 3rd Molar and Ramus Areas

Solution:

Reduce the thickness of the distal-occlusal area or shorten the posterior extension of the last mandibular molar



Photos courtesy of Dr. B. Gail Demko & Anton Voitik, MDT

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Managing Side Effects and Complications of Oral Appliance Therapy

TMD Symptoms from OA Therapy



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Jaw Pain or Discomfort

- **Prevalence:**

- In 10 studies assessing oral appliance therapy that included data on adverse effects from 1999-2005
- Prevalence ranged from 13-67% with an average of 34%

Ferguson, et al. *Sleep* 2006, 29(2): 244-262

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Summary of Research on TMD Side Effects of MAD Therapy

Do oral appliances lead to TMJ problems?

Results of Studies:

- No morphologic changes on MRIs noted in TMJs after OA use
- Oral appliance therapy proved to be innocuous over a one year period of treatment of OSA
 - ★ de Almeida, et al; *Sleep* 25(5), 2002
- At baseline 34% of patients had clicking, crepitus or tender muscles
- Overall, at 2 years TMJ status was improved or unaffected in all pts
 - ★ Fransson, *Swed Dent J Suppl*, 2003

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Summary of Research on TMD Side Effects of MAD Therapy

Results of Studies:

- TMJ complaints increase with length of OA treatment, but discontinuing treatment leads to improvement in symptoms
- Women had more TMD complaints than men

★ Almeida, et al; *J Clin Sleep Med* 1:2, 2005

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Summary of Research on TMD Side Effects of MAD Therapy

Results of Studies:

- Patients with TMD symptoms prior to treatment had a significant decrease in the intensity of TMD symptoms throughout treatment with a mandibular advancement device.
- Patients who developed mild TMD symptoms within the first few months of treatment had symptoms resolve
- Long-term usage of an oral appliance does not cause impairment to the temporomandibular joint

★ Giannasi, et al; *Sleep Breath* 2009 13:375-381

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Summary of Research on TMD Side Effects of MAD Therapy

Results of Studies:

- More tenderness in muscles of jaw with mandibular advancement of 50 and 75% compared to advancement of 25%

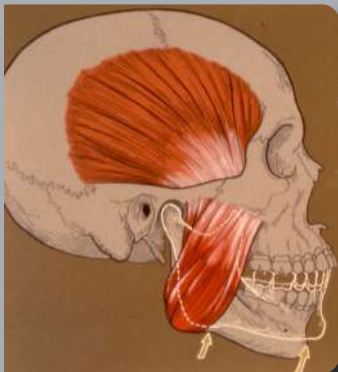
★Aarab, et al. *Clin Oral Investig* 14(3): 339-345, 2010

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Summary of Research on TMD Side Effects of MAD Therapy

Anatomic Sources of Pain:

- Inflammation in posterior attachment in TMJ
- Inflammation in lateral pterygoid or other muscles of mastication



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Bilateral Jaw Pain

● **Appliance is the Source:**

- Mandibular advancement beyond tolerance of TMJs and muscles
- Vertical dimension not within tolerance of jaw (too far open or closed)
- Appliance too tight or too loose



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Bilateral Jaw Pain

● **Solution:**

- Self care program for jaw pain management
- Retrude mandibular treatment position until patient comfortable for a few weeks then gradually advance again
- Modify vertical dimension (in office) until patient is comfortable
- Adjust retention on appliance
 - If too tight reduce periphery or IP areas
 - If too loose reline with cold-cured acrylic

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Unilateral Jaw Pain



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Unilateral Jaw Pain

Causes:

- **Imbalance in Appliance:**
 - Asymmetrical mandibular positioning in appliance
 - Uneven occlusal contact
 - Appliance is not seating
 - Side or stomach sleep position

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Unilateral Jaw Pain

- **Solution:**

- Self care program for jaw pain management
- Retrude screw mechanism on affected side 1/2 - 1 mm
- New bite registration and reset the OA symmetrically
- Balance the occlusion on appliance
- Be certain screws, wings etc. are contacting evenly

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Jaw Pain: Other Causes

- **An Event:**

- Bruxism while sleeping with pressure on jaw
- Biting into food; chewing tough food
- Use of statin medications can increase risk of jaw pain

- **Misuse of Morning Repositioner:**

- Use it too soon in AM (right after removing MAD)
- Too vigorous with biting into device

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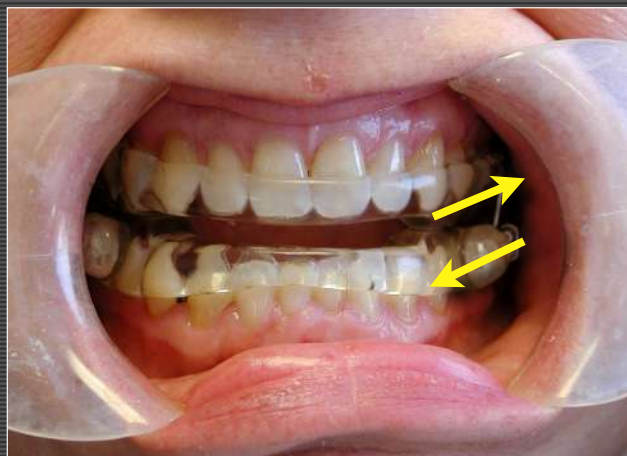
Occlusal Changes After Using a Mandibular Advancement Device (MAD)



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Why Do Adverse Effects on Occlusion Occur?

- Anterior forces acting on lower jaw and teeth
- Posterior forces acting on upper jaw and teeth



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Occlusal Changes After Use of MAD

- **Probable Cause:**
 - Edema or proliferation in posterior attachments in TMJ
 - Shortening of lateral pterygoid
 - Muscles lengthen and adapt to new mandibular position
 - ★ These three factors lead to posterior open bite
 - Tooth movement

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Preventing Occlusal Changes During Use of MAD

- Wait 10-15 minutes after waking
- Clench teeth into AM Aligner and hold for 2-3 seconds then release
- Repeat 4-5x/minute for 20 minutes

AM Aligner



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Managing Occlusal Changes After Use of MAD

Managing Occlusal Changes After They Occur:

● **Solution:**

- Use of an AM Positioner or similar device 3-4x/day followed by periodic clenching of teeth or gum chewing
- Consider discontinuing MAD if patient has diagnosis of primary snoring or less symptomatic, mild OSA
- Discontinue MAD and use CPAP while using AM Positioner AMAP

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Summary of Research on Occlusal Changes with MADs

- Robertson, et al; *Eur J Orthod* 25:371-376, 2003¹
- Almeida, et al; *Am J Orthod Dentof Orthop* 129: 195-204,2006²
- Almeida, et al; *Am J Orthod Dentof Orthop* 129: 205-213,2006³
- Marklund, et al; *Am J Orthod Dentof Orthop* 129: 205-213,2006⁴
- Doff, et al. *Sleep* 36(9): 1289-1296, 2013⁵
- Pliska, et al; *J Clin Sleep Med* 10(12): 1285-1291, 2014⁶

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Summary of Research on Occlusal Changes with MADs

Results of Studies:

- Decrease in OB and OJ ^{2,3}
- Forward shifting of mand first molars relative to max first molars ^{2,3}
- Retroclination of max incisors and proclination of mand incisors ^{2,3}

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Summary of Research on Occlusal Changes with MADs

Results of Studies:

- Changes in dental occlusion can be considered favorable or unfavorable ³
- 44% were considered to have favorable changes after 7.4 yrs. ³
- Favorable effects were mostly seen in patients with greater initial OJ and mandibular deficiencies ³

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Summary of Research on Occlusal Changes with MADs

Factors that increase probability of reduction in OJ

- Longer treatment duration
- More frequent use of OA
- More advancement of jaw position

Minagi, et al. *JCSM* 14(1): 119-125, 2018

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Summary of Research on Occlusal Changes with MADs

- Number of occlusal contact points in PM area significantly decreased
- More significant occlusal changes noted with anterior traction MAD than bilateral thrust MAD

Venema, et al. *JDSM* 5(2): 39-46, 2018

Anterior traction MAD



Bilateral thrust MAD



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Managing Occlusal Changes After Use of MAD

- **Solution:**

- Lab AM Positioner alone
- Lab AM Positioner plus lower Essix retainer



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Managing Occlusal Changes After Use of MAD

- **Solution:**

- Occlusal equilibration
- Orthodontic treatment

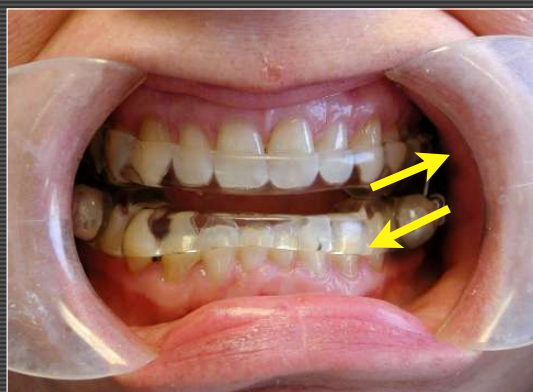


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Other Complications of OA Therapy: Tooth Movement

- **Probable Causes:**

- Forces on teeth from MADs
- Jaw position changes, so occlusal contacts change then teeth shift



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Other Complications of OA Therapy: Tooth Movement

- **Solutions:**

- Use Essix retainers with dimples in distal of 2nd molars
- Wear retainers at least 2 hours/day



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Questions



Lake One in Ely, MN



Walker Art Center Sculpture Garden



Split Rock Lighthouse